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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of : Customer Number: 20277
 Minh Van NGO, et al. : Confirmation Number: 3502
 Application No.: 10/617,450 : Tech Center Art Unit: 2818
 Filed: July 11, 2003 : Examiner: Tran, Long K.
 For: UNDOPED OXIDE LINER /PBSG FOR IMPROVED DATA RETENTION

TRANSMITTAL OF APPEAL BRIEF

Mail Stop Appeal Brief
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, VA 22313-1450

Sir:

Submitted herewith is Appellant's Appeal Brief in support of the Notice of Appeal filed August 10, 2005. Please charge the Appeal Brief fee of to Deposit Account 500417.

To the extent necessary, a petition for an extension of time under 37 I.E. 1.136 is hereby made. Please charge any shortage in fees due under 37 C.F.R. 1.17 and 41.20, and in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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TABLE OF CONTENTS

I.	REAL PARTY IN INTEREST.....	1
II.	RELATED APPEALS AND INTERFERENCES	1
III.	STATUS OF CLAIMS.....	1
IV.	STATUS OF AMENDMENTS.....	2
V.	SUMMARY OF CLAIMED SUBJECT MATTER.....	2
VI.	ISSUES TO BE REVIEWED ON APPEAL.....	3
VII.	ARGUMENT.....	3
	The Examiner's Position.....	3
	Appellants' Position.....	4
VIII.	CONCLUSION.....	7
IX.	PRAYER FOR RELIEF	7
	CLAIMS APPENDIX	8

Docket No.: 050432-0600

PATENT



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APPEAL BRIEF

Mail Stop Appeal Brief
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is submitted pursuant to the Notice of Appeal filed August 10, 2005.

I. REAL PARTY IN INTEREST

The real party in interest is Advance Micro Devices, Inc.

II. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any related Appeal or Interference.

III. STATUS OF CLAIMS

Claims 1 through 12 are pending in this Application, of which claims 1 through 9 stand withdrawn from consideration pursuant to the provisions of 37 C.F.R. § 1.142(b). Claims 13 and 14 have been cancelled. Claims 10 through 12 have been finally rejected. It is from the final rejection of claims 10 through 12 that this Appeal is taken.

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IV. STATUS OF AMENDMENTS

An Amendment was filed pursuant to 37 C.F.R. § 1.116 on July 1, 2005, subsequent to the issuance of the Final Office Action dated May 27, 2005. The Examiner issued a first Advisory Action dated July 21, 2005 indicating that the “...request for reconsideration has been considered but does NOT place the Application in condition for allowance. . . .” Since an Amendment, not a Request for Reconsideration had been submitted, Examiner Tran was telephoned and clarification was requested. As a result Examiner Tran issued a second Advisory Action by facsimile on July 27, 2005 indicating that the July 1, 2005 Amendment will be entered if an Appeal is taken and claims 10 through 12 would be rejected. Accordingly, Appellants are proceeding on the basis that the Amendment submitted on July 1, 2005 has been entered since an Appeal has been taken, and that the claims before the Honorable Board of Patent Appeals and Interferences (the “Board”) are those listed in the Claims appendix (Claims 10 through 12).

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 10 is directed to a semiconductor device comprising two gate electrode structures, each comprising a tunnel oxide 33 (Fig. 1; paragraph [19] of the written description of the specification, line 4) on semiconductor substrate 30 (Fig. 1; paragraph [19], line 2), a floating gate electrode 34 (Fig. 1; paragraph [19], line 5) on tunnel oxide 33, an interpoly dielectric oxide/nitride/oxide (ONO) stack 35 (Fig. 1; paragraph [19], line 5) on floating gate 34 and a control gate 36 (Fig. 1; paragraph [18], line 5) on interpoly dielectric 35. Silicon oxide spacers 38 (Fig. 1) are formed on the side surfaces of each gate electrode (paragraph [19], lines 7 and 8), and an undoped oxide liner 39 (Fig. 1) is on the silicon oxide spacers 38 filling the gap between the transistors (paragraph [19], lines 9 and 10). A layer of subatmospheric-chemical vapor deposited (SA-CVD)

boron and phosphorous doped silicon oxide (BPSG) 300 (Fig. 1) is formed on the undoped oxide liner 39 and fills the gap between the gate structures (paragraph [19], lines 10 through 14).

As set forth in paragraph [20], a conventional silicon nitride liner is strategically replaced with an undoped silicon oxide liner deposited by deposition of the BPSG layer, thereby improving data retention, improving gap filling, increasing manufacturing throughput and reducing defects (lines 1 through 5).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claim 10 was rejected under 35 U.S.C. § 102 for lack of novelty as evidenced by Huang et al.;

2. Claim 11 was rejected under 35 U.S.C. § 103 for obviousness predicated upon Huang et al.;

3. Claims 12 and 13 were rejected under 35 U.S.C. § 103 for obviousness predicated upon Huang et al. in view of Tseng et al.; and

4. Claim 14 was rejected under 35 U.S.C. § 103 for obviousness predicated upon Huang et al. in view of Tseng et al. and Nakatani.

As the limitations of claims 13 and 14 have been incorporated into claim 10, the pivotal issue on appeal is whether claim 10 is unpatentable under 35 U.S.C. § 103 for obviousness predicated upon Huang et al. in view of Tseng et al. and Nakatani.

VII. ARGUMENT

For the convenience of the Honorable Board, Appellants do not separately argue the patentability of claims 11 and 12, which claims stand or fall as a group with independent claim 10.

The Examiner's Position

In rejecting claim 13, which rejection Appellants will treat as though applied against independent claim 10 because the limitations of claim 13 and 14 have been incorporated into claim 10, the Examiner concluded that one having ordinary skill in the art would have been motivated to modify the particular structure illustrated in Fig. 4 of Huang et al. by forming a spacer in view of Tseng et al. The Examiner's reliance upon Nakatani in rejecting claim 14 is confusing, because although Nakatani is recited in the statement of the rejection. This reference is not discussed in the Examiner's exposition of the rejection. Rather, the Examiner refers to "Yet et al." presumably intending the reference to Yeh et al., U.S. Patent No. 5,840,607. The Examiner's reliance upon this reference is apparently for the use of silicon oxide as a sidewall spacer "... in order to use spacers as a mask to form source and drain by implanting impurities into a substrate" (page 6 of the May 27, 2005 Final Office Action, lines 10 through 13).

Appellants' Position

Appellants submit that the Examiner's rejection is not factually or legally viable, because the primary reference to Huang et al. **teaches away** from the claimed invention. Indeed, the Examiner does not gainsay, and in fact agrees, that his primary reference teaches away from the claimed invention.

The invention defined in independent claim 10 is directed to a semiconductor device comprising a layer of **BPSG** on an undoped oxide liner of filling a gap between two gate electrode structures, each gate electrode structure comprising a tunnel oxide, floating gate electrode, interpoly dielectric (ONO), and a control gate. In originally rejecting claim 10, the Examiner relied upon Figs. 1 through 4 of Huang et al. **But Figs. 1 through 3 of Huang et al. represent prior art and Huang et al. teach away from such prior art by eschewing use of a BPSG liner.** Indeed, in the sentence bridging pages 6 and 7 of the May 27, 2005 Final Office Action, the Examiner **acknowledges** that Huang et al. **teach away** from the claimed invention, but finds it more suitable to his purpose to focus on the prior art that his primary reference avoids.

In apparent recognition of the clear **teaching away** from the claimed invention by Huang et al., the Examiner predicated the rejection of claim 14 upon Fig. 4 of Huang et al. **But in Fig. 4 of Huang et al., which represents the invention of Huang et al., there is no BPSG layer.** This is because Huang et al., as admitted by the Examiner, **teach away from a BPSG layer.** In fact, as argued in the only full paragraph on page 7 of the responsive Amendment dated April 8, 2005, when it comes to the invention of Huang et al. in Fig. 4, **there is no BPSG layer.** Rather, Huang et al. employ an **HDP oxide layer** which **may** contain phosphorous.

The difference between a BPSG layer deposited by SA-CVD and the HDP layer employed by Huang et al. is considered important to Huang et al. This is because Huang et al. state that **void formation** attendant upon employing a BPSG layer is avoided, and that the HDP layer formed by high density plasma deposition is a high quality oxide with good thermal stability, low moisture uptake and excellent mechanical properties, similar in properties to a dense thermally-grown oxide.

Indeed, in section 11 commencing at page 6 of the May 27, 2005 Office Action, the Examiner clearly **agreed** with Appellants that a prior reference must be considered with respect to its **teaching**

away from a claimed invention. Not only did the Examiner agree with Appellants, the Examiner cited an appropriate provision of the MPEP as well as a judicial decision. A feature of the claimed invention which distinguishes over Huang et al. is the BPSG layer, and Huang et al. admittedly **teach away from a BPSG layer.**

Accordingly, if one having ordinary skill in the art would have been motivated to modify the device disclosed by Huang et al., and Appellants do **not** agree that the requisite fact-based motivation has been established, a sidewall spacer would be formed in the Fig. 4 embodiment **which does not contain a BPSG layer as in the claimed invention.** Clearly, the resulting structure would **not** correspond to the claimed invention. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1988).

Moreover, it is **inconceivable** that one having ordinary skill in the art would have gone one step further and modified the Fig. 4 embodiment of Huang et al. by eliminating the disclosed invention, which involves deposition of an HDP oxide layer, and replacing it with a BPSG layer which Huang et al. **do not want** and **condemn** because of void formation. It is totally improper to conclude that one having ordinary skill in the art would have been realistically motivated to modify an applied reference in a manner **inconsistent** with the disclosed objective. *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992); *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); *In re Schulpen*, 390 F.2d 1009, 157 USPQ 52 (CCPA 1968). The secondary references to Tseng et al. and Yeh et al. or Nakatani do not cure the previously argued deficiencies in the Examiner's selective reworking of the invention of Huang et al.

Based upon the foregoing Appellants submit that the Examiner did not establish a *prima facie* basis to deny patentability to the claimed invention under 35 U.S.C. § 103 for lack of the requisite

factual basis and want of the requisite realistic motivation. Moreover, there is a potent indicium of **nonobviousness** which merits consideration.

Evidence of nonobviousness

The primary reference to Wang et al. constitutes evidence of **nonobviousness in teaching away** from a **BPSG** layer, as claimed. Such an **admitted teaching away from the claimed invention** constitutes a potent indicium of **nonobviousness**. *Ecolochem Inc. v. Southern California Edison, Co.*, 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000); *In re Bell*, 991 F.2d 781, 26 USPQ2d 1529 (Fed. Cir. 1993); *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 6 USPQ2d 1601 (Fed. Cir. 1988); *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986).

VII. CONCLUSION

The Examiner did not establish a *prima facie* basis to deny patentability to the claimed invention under 35 U.S.C. § 103 for lack of the requisite factual basis and want of the requisite realistic motivation. Indeed, even if the applied references are combined, the claimed invention would not result. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, *supra*. Further, upon giving due consideration to the potent indicium of nonobviousness stemming from the teaching away from the claimed invention by the Examiner's primary reference to Huang et al., the conclusion appears inescapable that one having ordinary skill in the art would not have found the claimed invention as a whole obvious within the meaning of 35 U.S.C. § 103. *Ecolochem Inc. v. Southern California Edison, Co.*, *supra*. Appellants, therefore, submit that the Examiner's rejection of the appealed claims under 35 U.S.C. § 103 is not factually or legally viable and, hence, solicit withdrawal thereof.

VIII. PRAYER FOR RELIEF

For the reasons discussed *supra*, Appellants submit that the Examiner's rejection under 35 U.S.C. § 103 is factually and legally erroneous and, hence, solicit the Honorable Board to reverse the Examiner's rejections of the appealed claims.

To the extent necessary, a petition for an extension of time under 37 CFR § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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CLAIMS APPENDIX

10. A semiconductor device comprising:

two gate electrode structures, spaced apart by a gap, on a semiconductor substrate;
silicon oxide spacers on side surfaces of the gate electrode;
an undoped oxide liner on the silicon oxide spacers in the gap; and
a layer of subatmospheric-chemical vapor deposited (SA-CVD) boron (B) and phosphorous (P)-doped silicon oxide (BPSG) on the undoped oxide liner filling the gap, wherein the gate structures comprise:
a tunnel oxide on the semiconductor substrate;
a floating gate electrode on the tunnel oxide;
an interpoly dielectric comprising an oxide/nitride/oxide (ONO) stack on the floating gate; and
a control gate on the interpoly dielectric.

11. The semiconductor device according to claim 10, wherein the undoped oxide liner has a thickness of 400Å to 600Å.

12. The semiconductor device according to claim 10, where the undoped oxide liner comprises undoped silicon oxide derived from tetraethyl orthosilicate (TEOS).